Docket No. F-7859

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Junichi ISHIZUKA
Serial No.	:	10/619,103
Filed	:	July 14, 2003
For	:	MOLDING METHOD OF MICROLENS ARRAY AND MOLDING APPARATUS OF THE SAME
Group Art Unit	:	1731
Examiner	:	Queenie S. Dehghan
Confirmation No.	:	5800
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DECLARATION UNDER 37 C.F.R § 1.132

I, Junichi ISHIZUKA, hereby declare the following:

I am a citizen of Japan and I reside at 5-13-2, Motobuto, Urawa-ku, Saitama-shi, Saitama, Japan.

I am the inventor of the above-identified patent application.

My educational background is in materials engineering at Tolyo Institute of Technology.

I have been working in the field of materials engineering for 10 years.

I am currently employed in developing manufacturing techniques for glass molding.

I am familiar with U.S. Patent Application No. 10/619,103 and the following references cited in the rejections of the claims: U.S. Patent No. 6,305,194 (Budinski et al.) and JP 60-171234 (Shimizu et al.).

Comparison of the invention of U.S. Patent Application No. 10/619,103 and Budinski et al.

Budinski et al. is directed to a method for molding microlens arrays. In Budinski et al., Figure 5 shows the apparatus used for the molding and Figure 7 shows the molding itself. It is clear from Figures 5 and 7 that the preform 114 is not restricted by a restrictor as disclosed in U.S. Patent Application No. 10/619,103 ("'103 application"). In Figure 2, the '103 application discloses a molding apparatus where the glass material is not restricted and in Figures 3 and 4 discloses the middle plate 4 restricting the flow of the glass material. The arrangement of Figures 3 and 4 of the '103 application provides improved results relative to the apparatus shown in Figure 2. I am aware of the disclosure in Budinski et al. on page 4, lines 62-64 which states that the microlens arrays are free from surface figure distortion. The extent to which rheological parameters such as viscosity or other variables help improve performance in the invention of Budinski et al. will not be discussed in depth in the present Declaration. It is sufficient to state that the '103 application provides improved results with the restriction of the glass material as opposed to no restriction of the glass material.

Discussion of Shimizu et al.

Shimizu et al. is directed to a glass lens molding device in which the lenses are biconvex lenses, as made clear in the Figures and from the paragraph bridging pages 2-3 of the English translation. An objective of Shimizu et al. is to prevent the lens surfaces from being inclined. This is accomplished by utilizing slide core portions 3R and 3L to keep the dies positioned so as to avoid the inclination of the lens surfaces.

In Shimizu et al., the Figures indicate a lower die being wider than an upper die, the glass lens being formed between the lower die and the upper die. Shimizu et al. does not disclose that having the lower die be wider than the upper die will reduce the inclination of the molding surfaces.

Discussion of and Comparison Between Shimizu et al. and Budinski et al.

Heating

Budinski et al. is directed to induction heating with induction heating coil 116[1]. Fig. 5 of Budinski et al. shows the molds with an induction heating coil 116 around them and Budinski et al. discloses in column 4, lines 38-42 and lines 53-61 that induction heating is utilized for heating and that a mold body is preferably positioned surrounding the mold halves.

The sliding core parts 3L' and 3R' (or sliding core parts 3L and 3R) are positioned 360 degrees around the molding equipment in Shimizu et al., as is clear from the Figures of Shimizu et al. Additionally, the sliding core parts are advanced and retracted by cylinders 4. The position

[1]Other heating methods are disclosed, but Budinski et al. is primarily directed to induction heating, which is an expeditious way to perform the heating.

of the Office Action of December 12, 2007 ("Office Action") is that the sliding core parts 3L' and 3R' as well as the cylinder 4, which is necessary to move sliding core parts 3L' and 3R', can be added to the invention of Budinski et al. However, adding such comparatively large structures would interfere with the positioning of the heating coils, particularly since the sliding core parts substantially laterally enclose the area around the molding material. Additionally, such comparatively large pieces and their associated mechanisms of motion (e.g., cylinders 4) would also interfere with the positioning of the mold body that is preferably around the mold halves. Accordingly, adding the sliding core parts 3L and 3R' as well as cylinder 4 to the invention of Budinski et al. would significantly interfere with the heating of the mold apparatus of Budinski et al.

Amount of Glass Molding Material Used

The Figures of Shimizu et al. show the glass molding material extending to the sliding core parts and accumulating in the circular space portion 5A or concave portion space 5B.

There is no indication that any excess glass material is utilized in the invention of Budinski et al. Moreover, the disclosure of Budinski et al. teaches that such a situation would be detrimental for the invention of Budinski et al. In column 6, lines 42-67 is a rheological explanation regarding the invention of Budinski et al., where it is disclosed that Equation 2 can be used to estimate the load and viscosity required to achieve a specific mold compression rates. Budinski et al. states that if the glass flows too quickly that the glass will not completely expel gas from the microlens cavities. It is also clear from Budinski et al. (see Equation 1) that for any specific mold compression rates, that the increase in the volume of the glass preform will

increase the velocity of the glass front during molding. Accordingly, for any specific mold compression rates, Budinski et al. teaches that the volume of the glass preform cannot be too high since this will increase the velocity of flow of the glass front during molding which will adversely affect the removal of gas from the microlens cavities. Accordingly, Budinski et al. teaches that using too much glass material will result in diminished quality lenses.

Inclination of Lens Surfaces

Shimizu et al. discloses avoidance of inclination of lens surfaces by using slide core portions. There is no disclosure in Budinski et al. that there is an inclination problem with the lens surfaces. Moreover, Shimizu et al. is directed to forming single lenses while Budinski et al. is directed to forming microlens arrays, which means that having a lens surface inclination problem in Shimizu et al. does not necessarily mean that such lens surface inclination problem is also present in Shimizu et al. Moreover, the statement in column 4, lines 62-64 of Budinski et al. that the microlens arrays "are free from surface figure distortion" would indicate to one of ordinary skill in the art that there is no inclination problem with the lens surfaces in the invention of Budinski et al.

Shape of Lenses

Shimizu et al. discloses that Figure 6 shows ideal lens 20. In other words, Shimizu et al. teaches that the ideal shape for a lens is as shown in Figure 6. In contrast, Figure 5 of Shimizu et al. shows a shape of a lens that is not ideal since it includes an additional shape caused by the circular space portion 5A. Similarly, the inclusion of a concave portion space 5B would also

provide a lens which is not ideal. Thus, the lenses created by the invention of Shimizu et al. are not ideal. The optical performance of the portions of the lens where additional shapes are created by the sliding core parts of Shimizu et al. will be different than if the additional shapes are not created and therefore the presence of the sliding core parts will adversely affect the optical performance of the peripheral portions of the lens by creating a lens which does not have an ideal shape. If the sliding core parts of Shimizu et al. are used in the invention of Budinski et al. and there is, hypothetically, sufficient glass material to create the additional shapes mentioned above, then the peripheral portions of the microlens array, where the additional shapes are created, would have adverse optical performance relative to other locations on the microlens array. Accordingly, including the sliding core parts of Shimizu et al. in the invention of Budinski et al. such that additional shapes are created in the periphery of the microlens array of the invention of Budinski et al. will result in the optical performance of lens elements of a central area and a peripheral area of the microlens array to not be homogenized.

Also, the invention of Shimizu et al. is configured such that excess material flows into circular space portion 5A or concave portion space 5B. Thus, the availability of, for example, circular space portion 5A or concave portion space 5B creates a situation where the pressure exerted in the peripheral areas of the glass material is lower than a pressure exerted in the center of the glass material. This is caused because the material is merely being channeled to circular space portion 5A or concave portion space 5B as overflow. Therefore, the transfer performance on the peripheral sections would be less than in a central area because of this pressure differential. The modification of Budinski et al. to include the sliding core parts of Shimizu et al. will also result in a difference in transfer performance in a central area versus peripheral areas of the glass

material even if excess glass material is used since the glass material would be channeled to overflow sections and therefore result in a pressure differential between the center and periphery of the lens material. This difference in transfer performance will result in a difference in the optical characteristics of the peripheral lenses versus lenses in a central portion of the lens array.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date April 7, 2008

By Junichi Ishizuka

Junichi ISHIZUKA